

triangular plate G G, to which the prongs H H, pivoted at Z, are attached by springs K K. This results in bringing the copper piece O, the suspending rod of which is also pivoted at Z, into contact with the respective carbon block Q. From the diagram it will be seen that the direction of the rotation of the motor P, which raises or lowers the electrodes E E, depends upon the contact made by O with either Q or Q', and hence upon the rise or fall of the voltage in the circuit beyond the limit of 2 volts.

Mr. Héroult states that the cost of the furnace (charge 2,500 kgs.), building and necessary equipment, such as ladles, moulds, crane, etc., is about 50,000 francs, or \$10,-

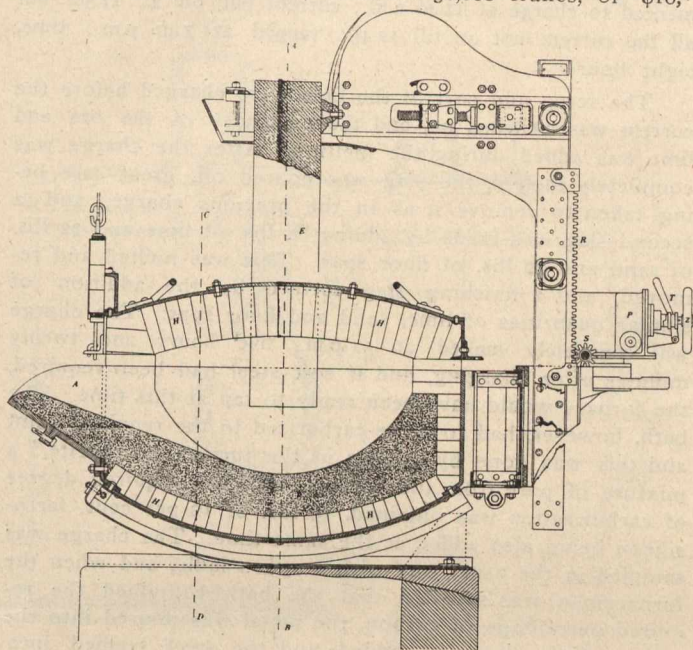


Fig. 1. Transverse Section E F.

000. This does not include the turbines and electrical machinery. The electrodes are square prisms 360 mm on the side and 170 cm long. They are made from retort coke which contains from 1 to 2 per cent. of sulphur. The binding material is tar. The coke delivered at La Praz costs 50 francs per metric ton, and the finished electrode 10 centimes per kg. The electrodes are not entirely consumed, and the short ends remaining are worked over into new electrodes, at a cost of 2 centimes per kg. The plant for making electrodes for one furnace is estimated by Mr. Héroult to cost \$5,000.

A Thompson recording wattmeter had been rented in Paris from La Compagnie pour la Fabrication des Compteurs, and ordered to be sent to La Praz, to be used for the determination of the electric energy absorbed. Unfortunately, however, the meter did not arrive in time to enable us to have it put in circuit. The electric measurements at La Praz were, therefore, made with the instruments (of Hartmann and Braun's manufacture), permanently mounted on the switch-board of the power house. The absorption of electric energy per ton of steel amounted to 0.153 electric horse-power years (English units). If tapped before completion of purification, the product to be employed for structural steel, the energy consumed amounted to only 0.1 electric horse-power years per ton.

#### Cost of Converting Scrap into Steel.

In a memorandum furnished by Mr. Harbord, at La Praz, the estimated cost of converting scrap into steel by the Héroult process, exclusive of cost of scrap and metal, amounted to \$14 per ton of product.

The following classes of steel are made at the La Praz works and at the selling prices per ton of 2,000 lbs. set opposite the description:

Steel of exceptional hardness .....	\$363 60
Class 1—Extra hard steel .....	272 60
“ 2—Very hard steel .....	272 60
“ 3—Hard steel .....	218 00
“ 4—Medium hard steel .....	218 00
“ 5—Tough, medium hard steel .....	145 40
“ 6—Tough steel .....	145 40
“ 7—Tough mild steel .....	123 20

#### Production of Pig.

Mr. Héroult was good enough to make some experiments for us in smelting iron ores. The furnace employed was exceedingly simple, consisting of an iron box of square cross-section open at top, and lined with refractory material. The bottom of the casing was provided with a carbon plate, which constituted one terminal of the electric circuit, the other terminal consisted of a carbon electrode of square cross-section about 3 feet in length, and placed vertically in the open top of the furnace. By hand regulation the distance of the electrode within the furnace could be varied. The charge was placed between the carbon plate at the bottom of the furnace and the vertically-adjustable electrode, and packed around the latter in the space between it and the walls of the furnace. The ore employed was in a more or less finely divided condition. The gases developed in the zone of fusion and reduction could not, therefore, readily escape, and whenever the pressure of the formed gas exceeded the weight of the charge above it, a blow-out would occur ejecting part of the charge. This, of course, would not occur if the charge consisted, not of fines, which prevent free egress of the gases formed, but of coarse material, with interstitial spaces for the discharge of the gases. These experiments were made for us by Mr. Héroult for the purpose of demonstrating the simplicity of the process of reducing iron ores by the electric process, and it was not intended to demonstrate a figure of cost per ton of pig produced by this process.

The Héroult process is covered by several patents in Canada. A letter from Dr. Héroult was received by Dr. Haanel at Ottawa since the Commission's report was published: I have the pleasure of informing you that since your last visit to La Praz the steel furnace you saw there has

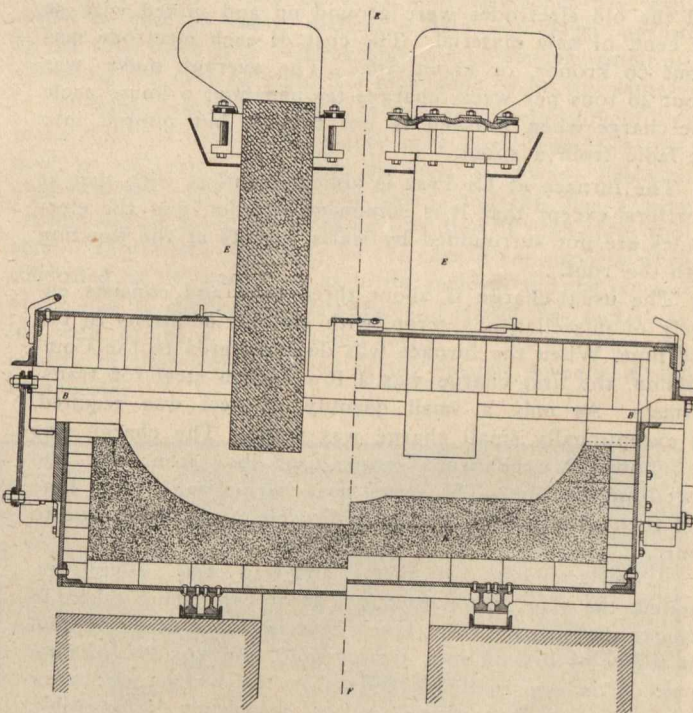


Fig. 2. Longitudinal Sections A B and C D.

been materially improved by the addition of water jackets round the electrodes. The effect is this: The output of the crucible has passed from four tons to seven tons in twenty-four hours. The absence of air is so complete that we obtain percentage of carbide of calcium in the slag. The loss of raw material has also greatly diminished.

F. W. Harbord, consulting metallurgist to the Government of India, in his report on this process says the furnace in use at Kortfors is similar to the tilting furnace used for the Siemens or open hearth process, except that the gas ports at each end are replaced by charging doors, and the temperature is maintained by carbon electrodes which pass through the roof. The furnace was about four-tons' capacity, basic lined, and the charge was entirely miscellaneous steel scrap. The electrodes were surrounded by water